

ABSTRACT

An optical encoding circuit (200) optically encodes a pulse train of signal light having a first wavelength according to a pulse train of control light which has a pulse train of an optically sampled optical analog signal and a second wavelength different from the first wavelength but close thereto, by using a plurality of optical encoders each of which includes optical nonlinear devices having input to output characteristics with different periodicities with respect to light intensity, and outputs a plurality of pulse trains of optically encoded signal light from the respective optical encoders. An optical quantization circuit (300) performs optical threshold processing on a pulse train of carrier wave light having a third wavelength different from the first wavelength but close thereto according to the plurality of pulse trains of optically encoded signal light, so as to optically quantize the pulse trains of carrier wave light, by using a plurality of optical threshold processors which are connected to the respective optical encoders and include optical nonlinear devices having periodic input to output characteristics with respect to the light intensity, respectively, and outputs pulse trains of optically quantized carrier wave light as optical digital signals.

An optically sampling device optically samples an optical analog signal using a sampled signal having a predetermined sampling frequency, and outputs control light having a pulse train of an optically sampled optical analog signal. A signal generating device generates a pulse train of signal light which is synchronized with the sampled signal. An optical encoding device optically encodes the pulse train of the signal light according to the control light, by using optical encoders each including nonlinear optical loop mirrors, and outputs pulse trains of optically encoded signal light from said optical encoders, respectively. An optically quantizing device performs optical threshold processing on the pulse trains of optically-encoded signal light to optically quantize them, by using at least one of optical threshold processors each of which is connected to each of said optical encoders and includes a nonlinear optical device, and outputs optically quantized pulse trains as optical digital signals.